

GEPHE SUMMARY

Tbx5 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase= [^] Tbx5 [^] #gephebase-summary-title)	Gephebase Gene	GP00001114	GepheID
Published	Entry Status	Martin	Main curator

PHENOTYPIC CHANGE

Morphology (https://www.gephebase.org/search-criteria?/and+Trait Category= [^] Morphology [^] #gephebase-summary-title)	Trait Category
Limb Identity (feathered feet) (<a href="https://www.gephebase.org/search-criteria?/and+Trait=<sup>^</sup>Limb Identity (feathered feet)<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=[^]Limb Identity (feathered feet)[^]#gephebase-summary-title)	Trait
Columba livia -scale-footed	Trait State in Taxon A
Columba livia - English Trumpeter (extreme feather-footed)	Trait State in Taxon B
Taxon A	Ancestral State
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic Status= [^] Domesticated [^] #gephebase-summary-title)	Taxonomic Status

Taxon A	Latin Name	Taxon B	Latin Name
Columba livia (<a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Columba livia<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=[^]Columba livia[^]#gephebase-summary-title)	Columba livia (<a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Columba livia<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=[^]Columba livia[^]#gephebase-summary-title)	Columba livia (<a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Columba livia<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=[^]Columba livia[^]#gephebase-summary-title)	Columba livia (<a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Columba livia<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=[^]Columba livia[^]#gephebase-summary-title)
rock pigeon	rock pigeon	rock pigeon	rock pigeon
Columba livia domestica; rock pigeon; carrier pigeon; domestic pigeon; rock dove; Columba livia Gmelin, JF, 1789	Columba livia domestica; rock pigeon; carrier pigeon; domestic pigeon; rock dove; Columba livia Gmelin, JF, 1789	Columba livia domestica; rock pigeon; carrier pigeon; domestic pigeon; rock dove; Columba livia Gmelin, JF, 1789	Columba livia domestica; rock pigeon; carrier pigeon; domestic pigeon; rock dove; Columba livia Gmelin, JF, 1789
species	species	species	species
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria; Aves; Neognathae; Columbiformes; Columbidae; Columba	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria; Aves; Neognathae; Columbiformes; Columbidae; Columba	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria; Aves; Neognathae; Columbiformes; Columbidae; Columba	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria; Aves; Neognathae; Columbiformes; Columbidae; Columba
Columba () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8931)	Columba () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8931)	Columba () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8931)	Columba () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8931)
8932 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8932)	8932 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8932)	8932 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8932)	8932 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8932)
No	is Taxon A an Intraspecies?	Yes	is Taxon B an Intraspecies?
			Taxon B Description
			Columba livia - English Trumpeter (extreme feather-footed)

GENOTYPIC CHANGE

TBX5	Generic Gene Name	UniProtKB Gallus gallus
-	Synonyms	Q9PWE8 (http://www.uniprot.org/uniprot/Q9PWE8) EMC78932 (https://www.ncbi.nlm.nih.gov/nuccore/EMC78932)
9031.ENS GALP00000013419 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9031.ENS GALP00000013419)	String	GenebankID or UniProtKB
-	Sequence Similarities	
	GO - Molecular Function	
GO:0001228 : DNA-binding transcription activator activity, RNA polymerase II-specific (https://www.ebi.ac.uk/QuickGO/term/GO:0001228)		
GO:0003700 : DNA-binding transcription factor activity		

(<https://www.ebi.ac.uk/QuickGO/term/GO:0003700>)
GO:0043565 : sequence-specific DNA binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0043565>)
GO:0008134 : transcription factor binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0008134>)
GO:0003677 : DNA binding (<https://www.ebi.ac.uk/QuickGO/term/GO:0003677>)
GO:0000981 : DNA-binding transcription factor activity, RNA polymerase II-specific
(<https://www.ebi.ac.uk/QuickGO/term/GO:0000981>)
GO:0000978 : RNA polymerase II proximal promoter sequence-specific DNA binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0000978>)
GO:0097110 : scaffold protein binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0097110>)
GO:0051087 : chaperone binding (<https://www.ebi.ac.uk/QuickGO/term/GO:0051087>)
GO:0030274 : LIM domain binding (<https://www.ebi.ac.uk/QuickGO/term/GO:0030274>)

GO - Biological Process

GO:0045944 : positive regulation of transcription by RNA polymerase II
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045944>)
GO:0007507 : heart development (<https://www.ebi.ac.uk/QuickGO/term/GO:0007507>)
GO:0030326 : embryonic limb morphogenesis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0030326>)
GO:0045893 : positive regulation of transcription, DNA-templated
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045893>)
GO:0007267 : cell-cell signaling (<https://www.ebi.ac.uk/QuickGO/term/GO:0007267>)
GO:0008285 : negative regulation of cell proliferation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0008285>)
GO:0032526 : response to retinoic acid
(<https://www.ebi.ac.uk/QuickGO/term/GO:0032526>)
GO:0030324 : lung development (<https://www.ebi.ac.uk/QuickGO/term/GO:0030324>)
GO:0010468 : regulation of gene expression
(<https://www.ebi.ac.uk/QuickGO/term/GO:0010468>)
GO:0002009 : morphogenesis of an epithelium
(<https://www.ebi.ac.uk/QuickGO/term/GO:0002009>)
GO:0060174 : limb bud formation (<https://www.ebi.ac.uk/QuickGO/term/GO:0060174>)
GO:0060045 : positive regulation of cardiac muscle cell proliferation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0060045>)
GO:0035137 : hindlimb morphogenesis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0035137>)
GO:0030336 : negative regulation of cell migration
(<https://www.ebi.ac.uk/QuickGO/term/GO:0030336>)
GO:0048513 : animal organ development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0048513>)
GO:0035115 : embryonic forelimb morphogenesis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0035115>)
GO:0060413 : atrial septum morphogenesis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0060413>)
GO:0003181 : atrioventricular valve morphogenesis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0003181>)
GO:0003166 : bundle of His development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0003166>)
GO:0003218 : cardiac left ventricle formation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0003218>)
GO:0055007 : cardiac muscle cell differentiation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0055007>)
GO:0003197 : endocardial cushion development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0003197>)
GO:0060173 : limb development (<https://www.ebi.ac.uk/QuickGO/term/GO:0060173>)
GO:0060044 : negative regulation of cardiac muscle cell proliferation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0060044>)
GO:0007389 : pattern specification process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0007389>)
GO:0060039 : pericardium development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0060039>)
GO:0051891 : positive regulation of cardioblast differentiation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0051891>)
GO:0072513 : positive regulation of secondary heart field cardioblast proliferation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0072513>)
GO:0003281 : ventricular septum development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0003281>)

GO - Cellular Component

GO:0015629 : actin cytoskeleton (<https://www.ebi.ac.uk/QuickGO/term/GO:0015629>)
GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)
GO:0005634 : nucleus (<https://www.ebi.ac.uk/QuickGO/term/GO:0005634>)
GO:0032991 : protein-containing complex
(<https://www.ebi.ac.uk/QuickGO/term/GO:0032991>)
GO:0032993 : protein-DNA complex
(<https://www.ebi.ac.uk/QuickGO/term/GO:0032993>)
GO:0001725 : stress fiber (<https://www.ebi.ac.uk/QuickGO/term/GO:0001725>)
GO:0005884 : actin filament (<https://www.ebi.ac.uk/QuickGO/term/GO:0005884>)

Unknown (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Unknown^#gephebase-summary-title>)

Presumptive Null

Cis-regulatory (<https://www.gephebase.org/search-criteria?/and+Molecular Type=Cis-regulatory^#gephebase-summary-title>)

Molecular Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Aberration Type=^Unknown^#gephebase-summary-title>)

Aberration Type

unknown

Molecular Details of the Mutation

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Linkage Mapping^#gephebase-summary-title>)

Experimental Evidence

Molecular shifts in limb identity underlie development of feathered feet in two domestic avian species. (2016) (<https://pubmed.ncbi.nlm.nih.gov/26977633>)

Main Reference

Domyan ET; Kronenberg Z; Infante CR; Vickrey AI; Stringham SA; Bruders R; Guernsey MW; Park S; Payne J; Beckstead RB; Kardon G; Menke DB; Yandell M; Shapiro MD

Authors

Birds display remarkable diversity in the distribution and morphology of scales and feathers on their feet, yet the genetic and developmental mechanisms governing this diversity remain unknown. Domestic pigeons have striking variation in foot feathering within a single species, providing a tractable model to investigate the molecular basis of skin appendage differences. We found that feathered feet in pigeons result from a partial transformation from hindlimb to forelimb identity mediated by cis-regulatory changes in the genes encoding the hindlimb-specific transcription factor Pitx1 and forelimb-specific transcription factor Tbx5. We also found that ectopic expression of Tbx5 is associated with foot feathers in chickens, suggesting similar molecular pathways underlie phenotypic convergence between these two species. These results show how changes in expression of regional patterning genes can generate localized changes in organ fate and morphology, and provide viable molecular mechanisms for diversity in hindlimb scale and feather distribution.

Abstract

Additional References

RELATED GEPHE

1 (Pitx1) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^8932^/and+Trait=Limb Identity/and+groupHaplotypes=true#gephebase-summary-title>)

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS

Gain-of-function (hindlimb expression of a forelimb specific gene)